How to Test and Deploy a Python Web App

An Opinionated Tour of Testing Tools

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Using Python to build, test and deploy applications at:

- &Yet
- Mozilla
- Seesmic
- Open Source Applications Foundation

This talk will not be

- a deep dive into any one area of testing
- a debate on which style, framework or methodology is better

This talk will be

- Opinionated
- A list of what tools are available
- A collection of resources available
- Useful (hopefully)

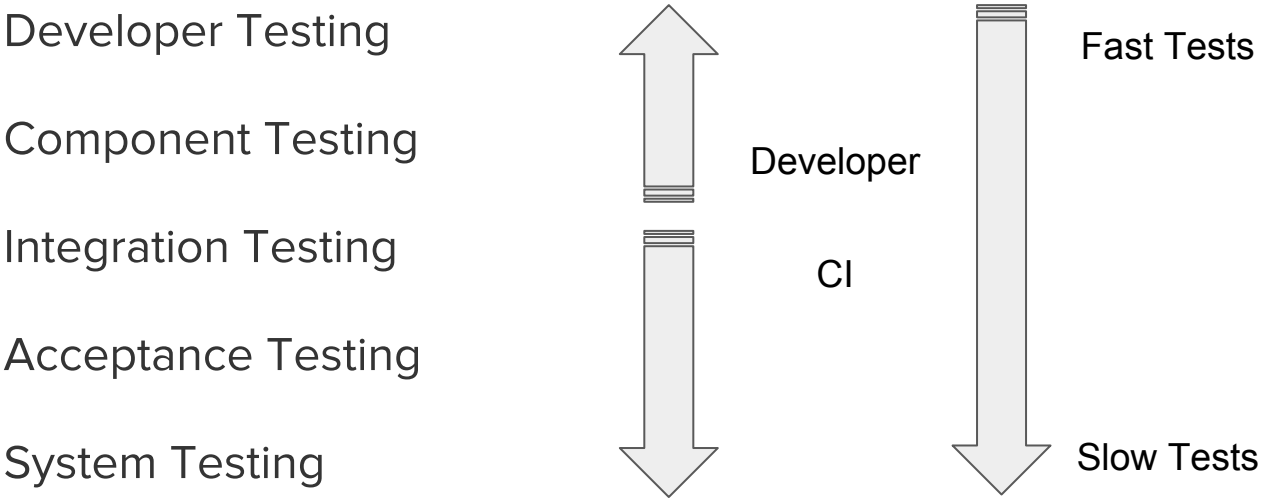
Tenki - A Weather Service

Flask Web site & API that returns the weather
https://github.com/bear/tenki

OpenWeatherMap
http://openweathermap.org/api

PyOWM - Python wrapper for the OpenWeatherMap API
https://github.com/csparpa/pyowm

Python Web App Testing Path



Developer Testing

- Must be *very* fast
- Started via Makefile
- pytest
- Must be fast
- pre-commit hooks
- PyEnv -- **NO System Python**
- Able to run specific test(s)
- Did I mention fast

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Makefile

```
clean:
	python manage.py clean
lint: clean
	pycodestyle --config={toxinidir}/setup.cfg
test: clean
	python manage.py test

integration:
	python manage.py integration

coverage: lint
	@coverage run --source=tenki manage.py test
	@coverage html
	@coverage report

info:
	@python --version
	@pip --version
	@virtualenv --version

ci: info test integration coverage
	@CODECOV_TOKEN=`cat .codecov-token` codecov

all: clean integration coverage

install-hook:
	git-pre-commit-hook install --force --plugins json --plugins yaml \
		--plugins flake8 --flake8_ignore E111,E124,E126,E201,E202,E221,E241,E302,E501,N802,N803
```

manage.py (a Flask-Script)

```
import sys
from flask.ext.script import Manager, Server
from flask.ext.script.commands import Command, ShowUrls, Clean
from tenki import create_app

def test(marker="not web and not integration"):
    test_args = ['--strict', '--verbose', '--tb=long', 'tests', '-m', marker]
    import pytest
    errno = pytest.main(test_args)
    sys.exit(errno)

class Test(Command):
    def run(self):
        self.test_suite = True
        test()
class Integration(Command):
    def run(self):
        self.test_suite = True
        test(marker="integration")
class WebTests(Command):
    def run(self):
        self.test_suite = True
        test(marker="web")

app = create_app('tenki.settings.%sConfig' % env.capitalize())
manager = Manager(app)
manager.add_command("test", Test())
manager.add_command("integration", Integration())
manager.add_command("webtest", WebTests())
```

pyenv -- https://pypi.python.org/pypi/pyenv

```
bear@opus ~/circleci/tenki
$ pyenv virtualenv 2.7.10 tenki27
New python executable in
/usr/local/var/pyenv/versions/2.7/envs/tenki27/bin/python2.7
...

bear@opus ~/circleci/tenki
$ pyenv local tenki27
pyenv-virtualenv: deactivate
pyenv-virtualenv: activate tenki

(tenki27)
bear@opus ~/circleci/tenki
$ git clone git@github.com:bear/tenki.git .

(tenki27)
bear@opus ~/circleci/python_testing/tenki (master %)
$ make update-all
```

pytest -- http://pytest.org/latest/

- runs on Posix/Windows, Python 2.6-3.5, PyPy
- Mature testing framework that has no boilerplate,
- Doesn't require special syntax for assertions,
- Tests can be written as xUnit classes or as functions,
- pytest can run tests written using nose, unittest, and doctest.
- Marking test functions with attributes,
- Skip and xfail

git pre-commit -- https://pypi.python.org/pypi/git-pre-commit-hook

built-in plugins for:

- validate json files
- validate Python-code with flake8
- validate Python-code with frosted
- validate .rst files with restructuredtext_lint
- validate .ini files with configparser
- validate .yaml files with PyYAML
- validate .xml files with xml.etree.ElementTree
- check filesize

http://trixie-j-lulamoon.deviantart.com/art/You-shall-not-pass-424148297

setup.cfg

```
[check-manifest]
ignore =
  circle.yml

[pycodestyle]
ignore = E111,E124,E126,E201,E202,E221,E241,E302,E501

[tool:pytest]
markers =
  web: tests that require chrome webdriver
  integration: tests that require mocking or external services
```

Component Testing

Docker Compose

- nginx
- uwsgi
- robcherry/docker-chromedriver:latest

NOTE - Docker is not the only way to do WebUI or Component testing. Some consider it heavy-handed in that it requires developers to maintain a tech stack (which perversely re-introduces “worked on my stack” issues.)

docker-compose.yml

```
uwsgi:
    build: .
    dockerfile: docker-uwsgi
web:
    build: .
    dockerfile: docker-nginx
    links:
        - uwsgi
    expose:
        - 8000
    ports:
        - "8000:8000"
chromedriver:
    image: robcherry/docker-chromedriver:latest
    links:
        - web
    ports:
        - "4444:4444"
    environment:
        CHROMEDRIVER_WHITELISTED_IPS: ""
```

makefile

```
docker-cleanup:
    docker rm $(docker ps -q -f 'status=exited')
    docker rmi $(docker images -q -f "dangling=true")

docker-build:
    docker-compose build
    docker-compose pull
    docker-compose rm -f

docker-start:
    docker-compose up -d

webtest: docker-start
    $(eval DRIVER_IP := $(shell ./wait_for_ip.sh))
    DOCKER_IP=$(DOCKER_IP) python manage.py webtest
    docker-compose stop
```

tenki-nginx.conf

```
upstream app {
    server uwsgi:8001;
}

server {
    listen       8000  default_server;
    server_name  _;
    charset     utf-8;

    location / {
        uwsgi_pass  app;
        include     /etc/nginx/uwsgi_params;
    }
}
```

```
# bundle application as a tarball
BDATE=`date +%Y%m%d` git archive -o tenki_${BDATE}.tar.gz branch
```

```
# start uwsgi service
uwsgi --socket :8001 --chdir /opt/tenki --module uwsgi-app --callable
application
```

```
#!/usr/bin/env python
# uwsgi-app.py
import os
from tenki import create_app

env = os.environ.get('TENKI_ENV', 'prod')
application = create_app('tenki.settings.%sConfig' % env.capitalize())

if __name__ == "__main__":
    application.run()
```

Deploy

Google Cloud and AppEngine

https://circleci.com/docs/deploy-google-app-engine

```
gcloud -q preview app deploy app.yaml --promote --version=staging
```

Resources

Tox -- Run tests using different Python versions

Coverage.py -- Measure code coverage during test runs

Mock -- Replace code with mock objects

https://pages.18f.gov/testing-cookbook/python/
http://docs.python-guide.org/en/latest/writing/tests/
https://pythonhosted.org/testing/

Review

Created a Developer environment that enforced good patterns

- lint, unit tests, pre-commit checks, local testing

Created a component/integration test environment using Docker

- This allows us to have developer and QA tests be identical

Created a Makefile to coordinate start, stop and test runs

- Again, allows us to have the identical paths for Dev, QA, CI, CD

Hopefully learned something new!

Questions?

CircleCI Support

https://discuss.circleci.com/

Example Repo

https://github.com/bear/tenki/